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(12) **United States Patent**
**Zernach et al.**

(10) **Patent No.: US 9,574,398 B2**
(45) **Date of Patent: Feb. 21, 2017**

(54) **ROLLER SHADE FILLER PANEL**

(71) Applicant: **Panduit Corp.**, Tinley Park, IL (US)

(72) Inventors: **Gary L. Zernach**, Cumming, GA (US); **Nathan W. Pascarella**, Buford, GA (US); **Darron J. Wright**, Cumming, GA (US); **Travis M. Samples**, Dawsonville, GA (US); **Joseph Allen Dukes**, Sugar Hill, GA (US); **Mark A. Acklin**, Mokena, IL (US); **James N. Fleming**, Naperville, IL (US); **Samuel C. Ramey**, Naperville, IL (US); **Frank J. Graczyk**, New Lenox, IL (US); **Alva B. Eaton**, Nottingham Park, IL (US)

(73) Assignee: **Panduit Corp.**, Tinley Park, IL (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 15 days.

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(22) Filed: **Dec. 11, 2014**

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US 2015/0090410 A1 Apr. 2, 2015

**Related U.S. Application Data**

(63) Continuation of application No. 13/314,730, filed on Dec. 8, 2011, now Pat. No. 8,915,286.
(Continued)

(51) **Int. Cl.**

| | |
|---|---|
| ***E06B 9/00*** | (2006.01) |
| ***E06B 9/78*** | (2006.01) |
| *H05K 7/14* | (2006.01) |

(52) **U.S. Cl.**
CPC ..... ***E06B 9/78*** (2013.01); ***H05K 7/1488*** (2013.01); *H05K 7/1489* (2013.01)

(58) **Field of Classification Search**
CPC ..... E06B 9/54; E06B 9/56; E06B 9/78; E06B 9/58; E06B 2009/583; H05K 7/1488; H05K 7/1489
(Continued)

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*Primary Examiner* — Katherine Mitchell
*Assistant Examiner* — Jeremy Ramsey
(74) *Attorney, Agent, or Firm* — Christopher S. Clancy; James H. Williams; Aimee E. McVady

(57) **ABSTRACT**

Certain embodiments of the present invention provide an apparatus for closing off an opening above, below, or between electronic equipment in a rack. The rack includes a pair of equipment rails. The electronic equipment is mounted to the equipment rails. The apparatus includes a base, a roller shade, and a handle. The roller shade is rotatably connected to the base and includes a free end extending from the base when the roller shade is rotated. The handle is connected to the free end of the roller shade. The base is removably connected to the equipment rails at a first

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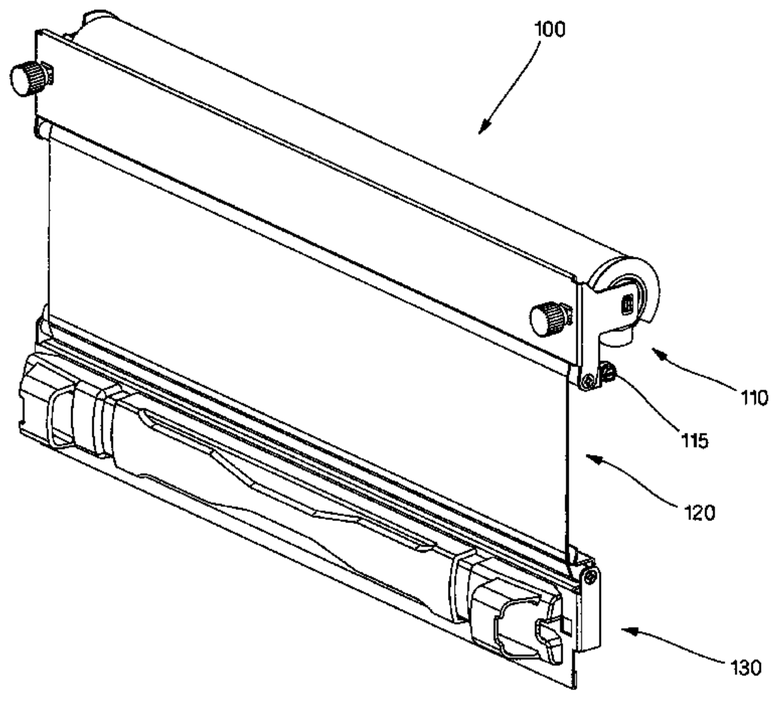

position. The handle is removably connected to the equipment rails at a second position spaced apart from the first position such that the free end of the roller shade is extended to close off the opening in the rack.

**15 Claims, 19 Drawing Sheets**

**Related U.S. Application Data**

(60) Provisional application No. 61/424,116, filed on Dec. 17, 2010.

(58) **Field of Classification Search**
USPC ..... 160/280, 281, 290.1, 31, 24; 292/137, 292/156, 162, 163, 168, 177, 179, 302
See application file for complete search history.

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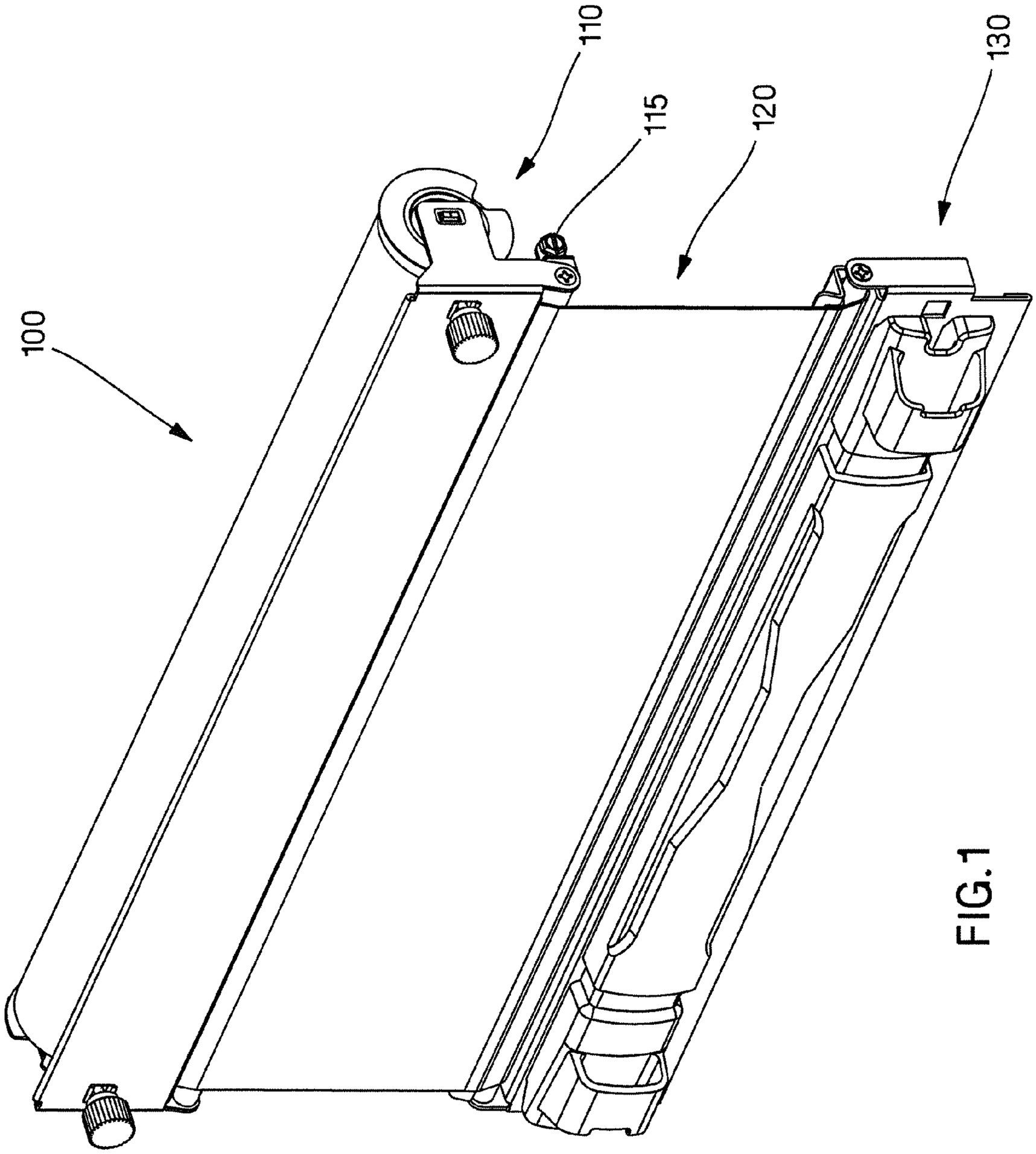


FIG.1

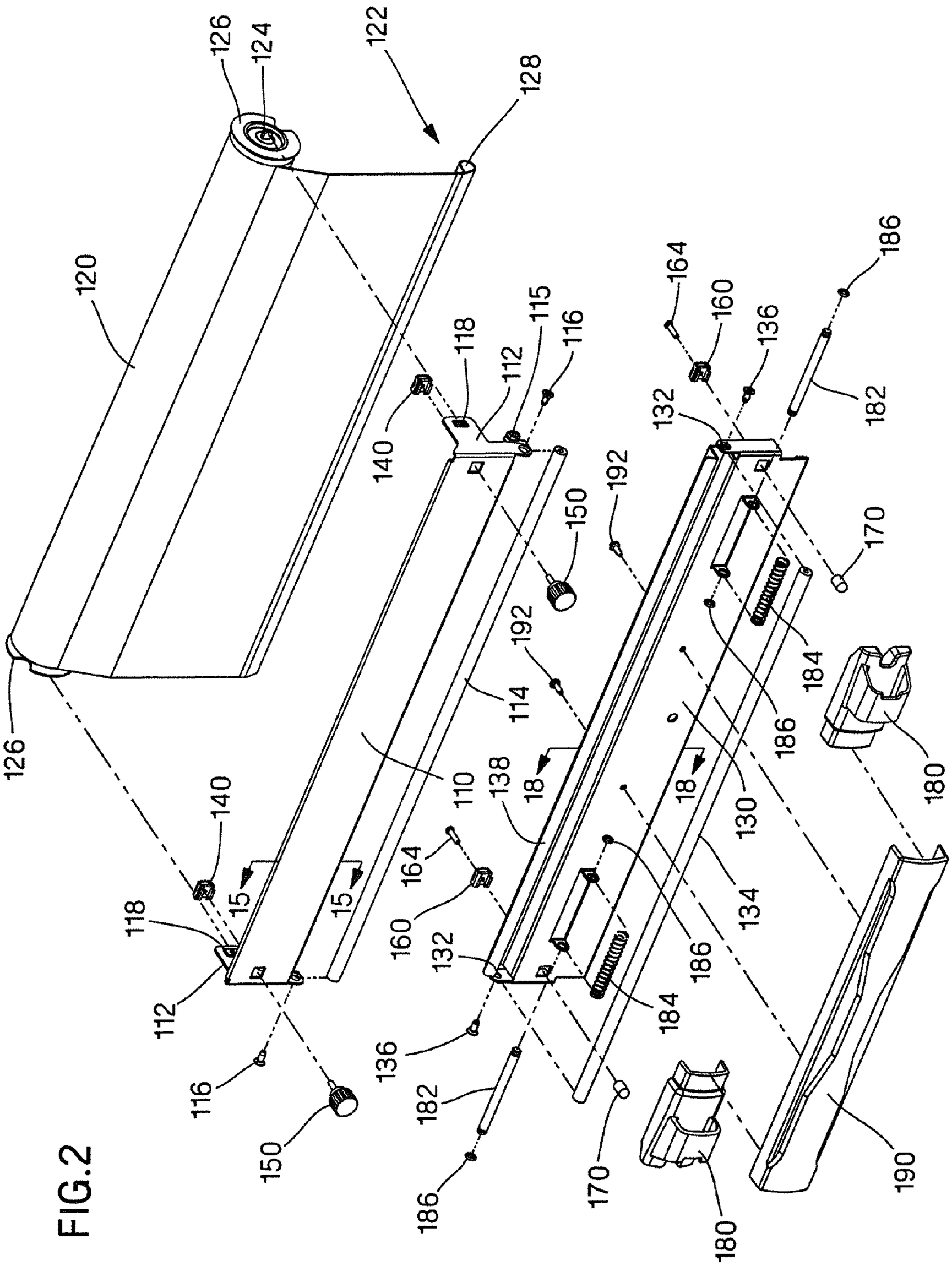
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FIG.2

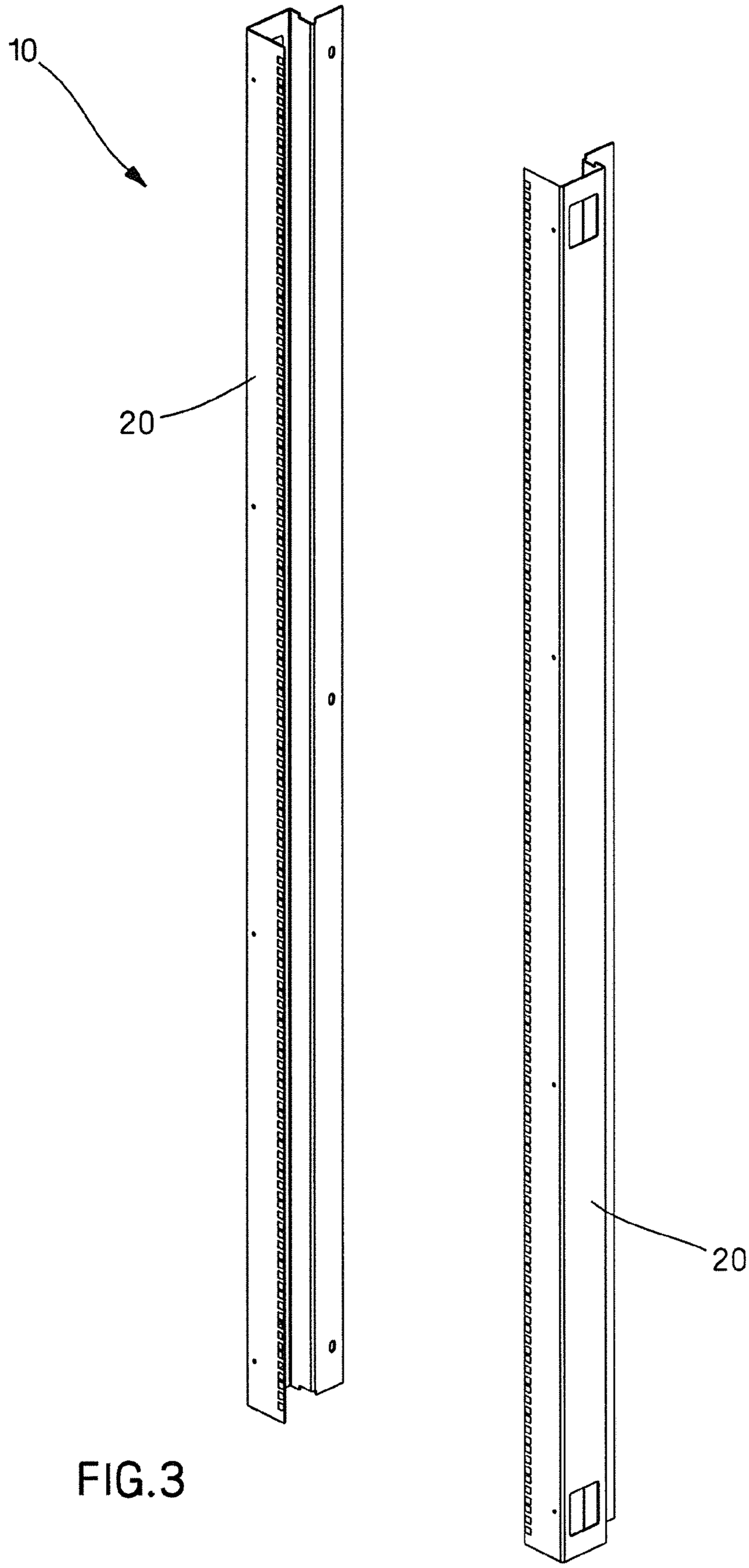


FIG.3

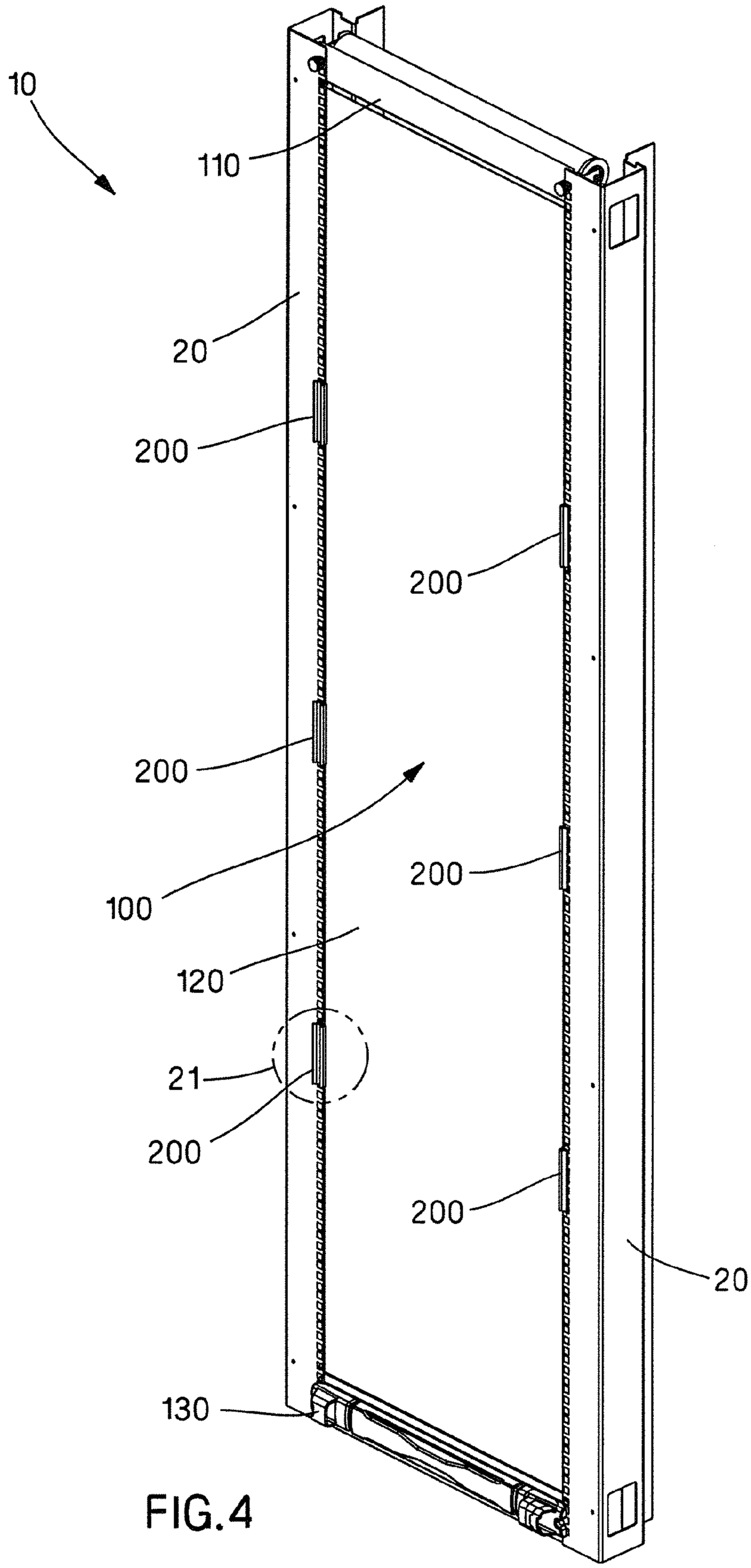


FIG.4

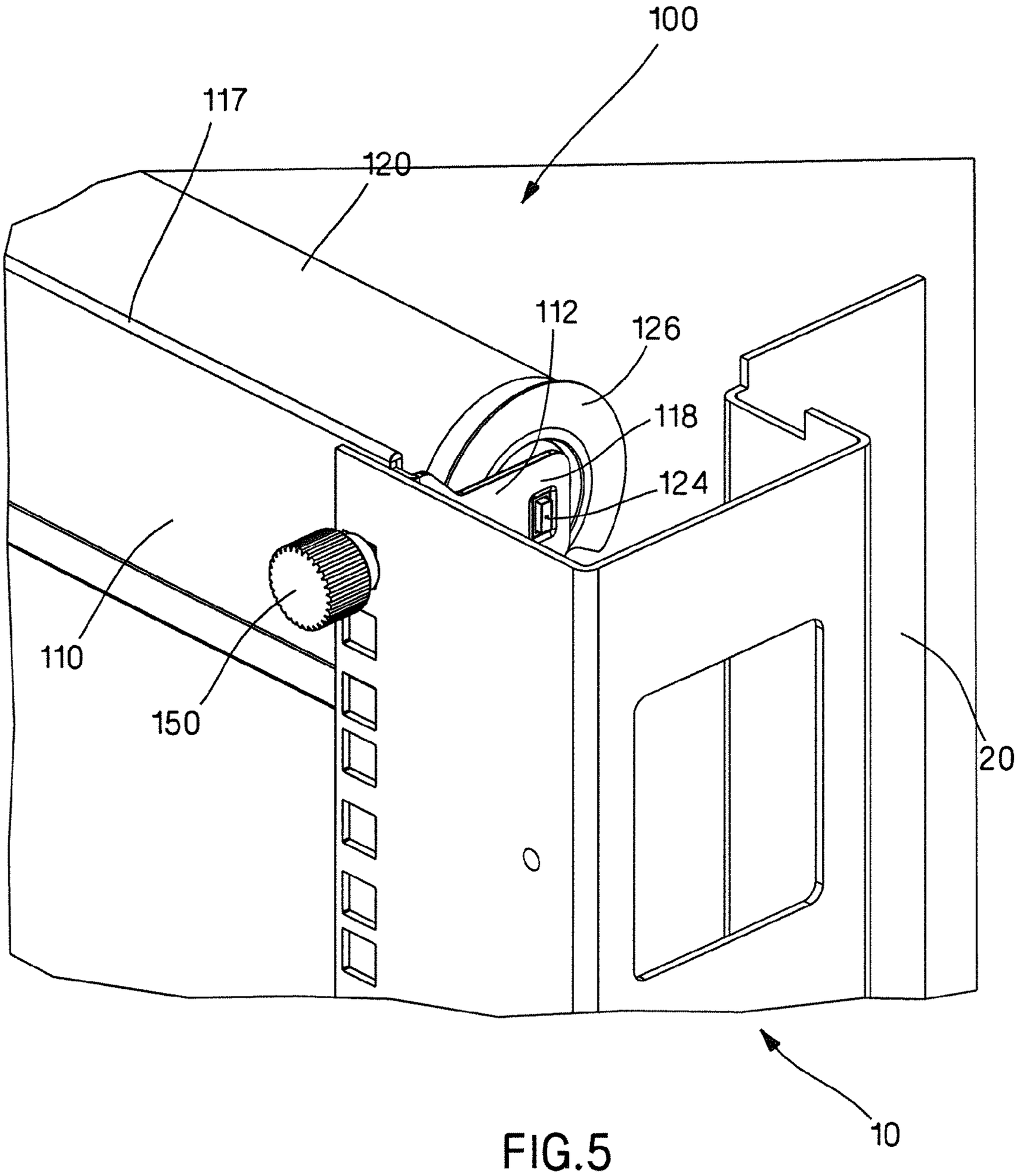


FIG.5

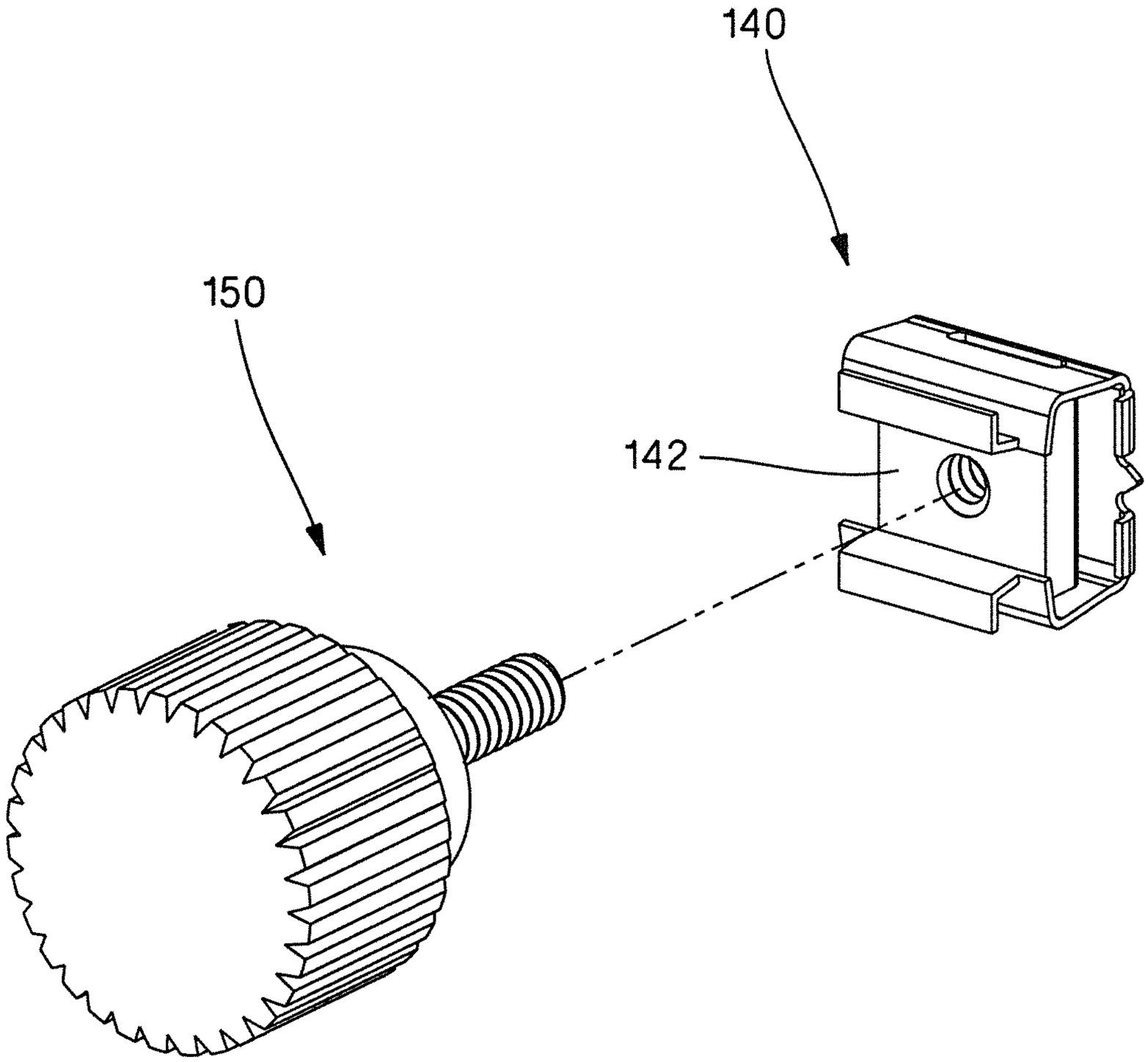


FIG.6

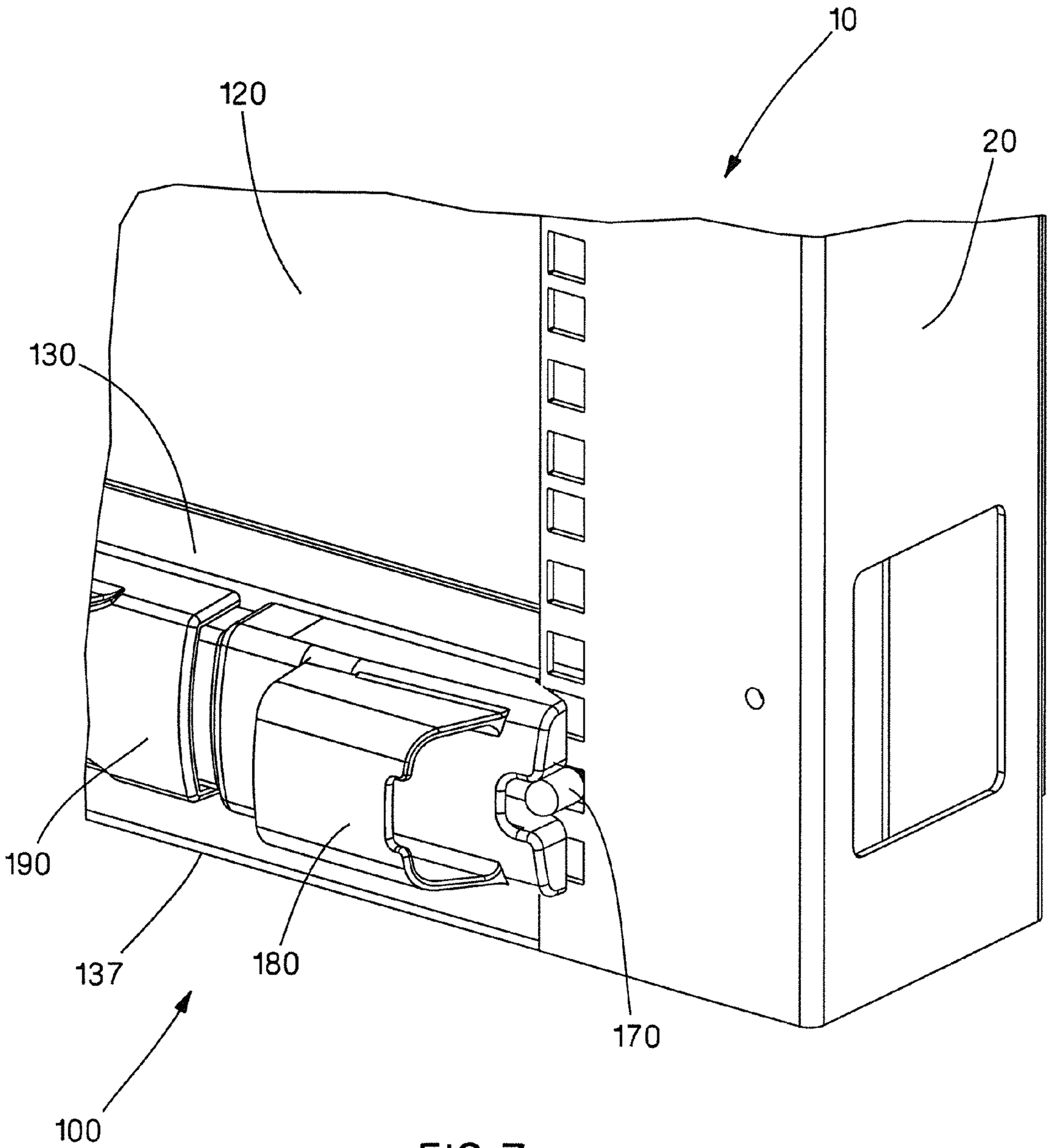


FIG.7

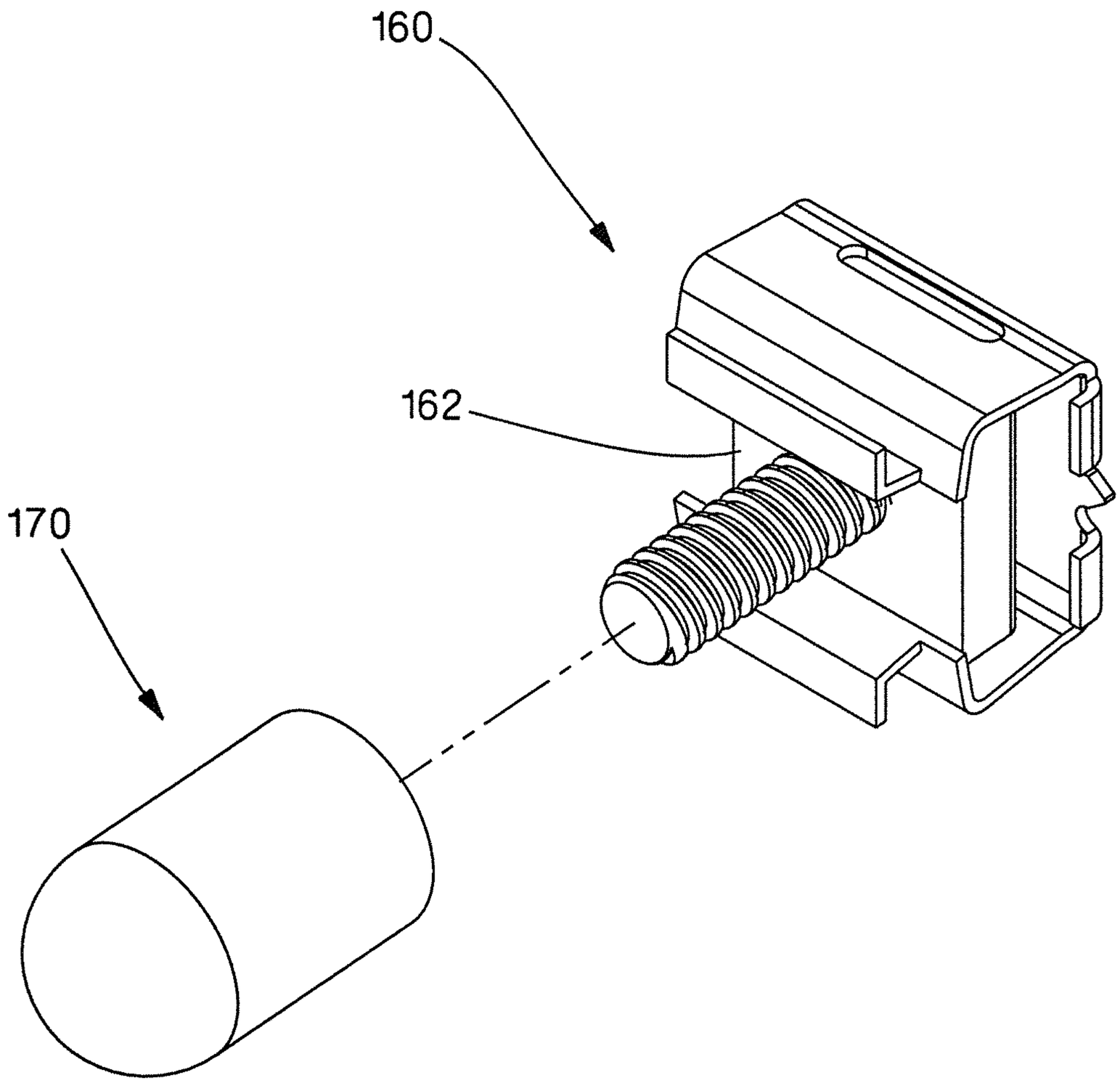


FIG.8

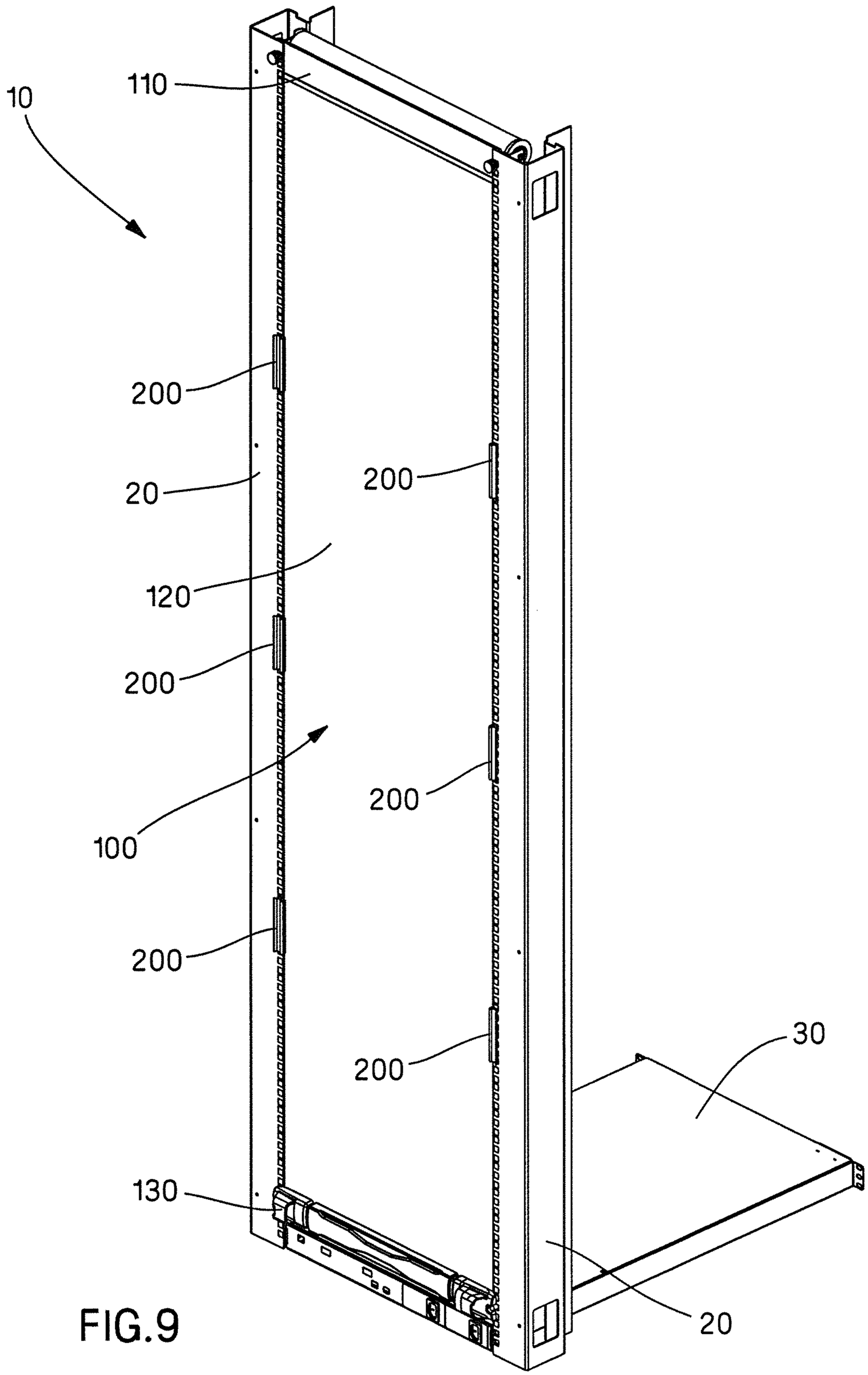


FIG.9

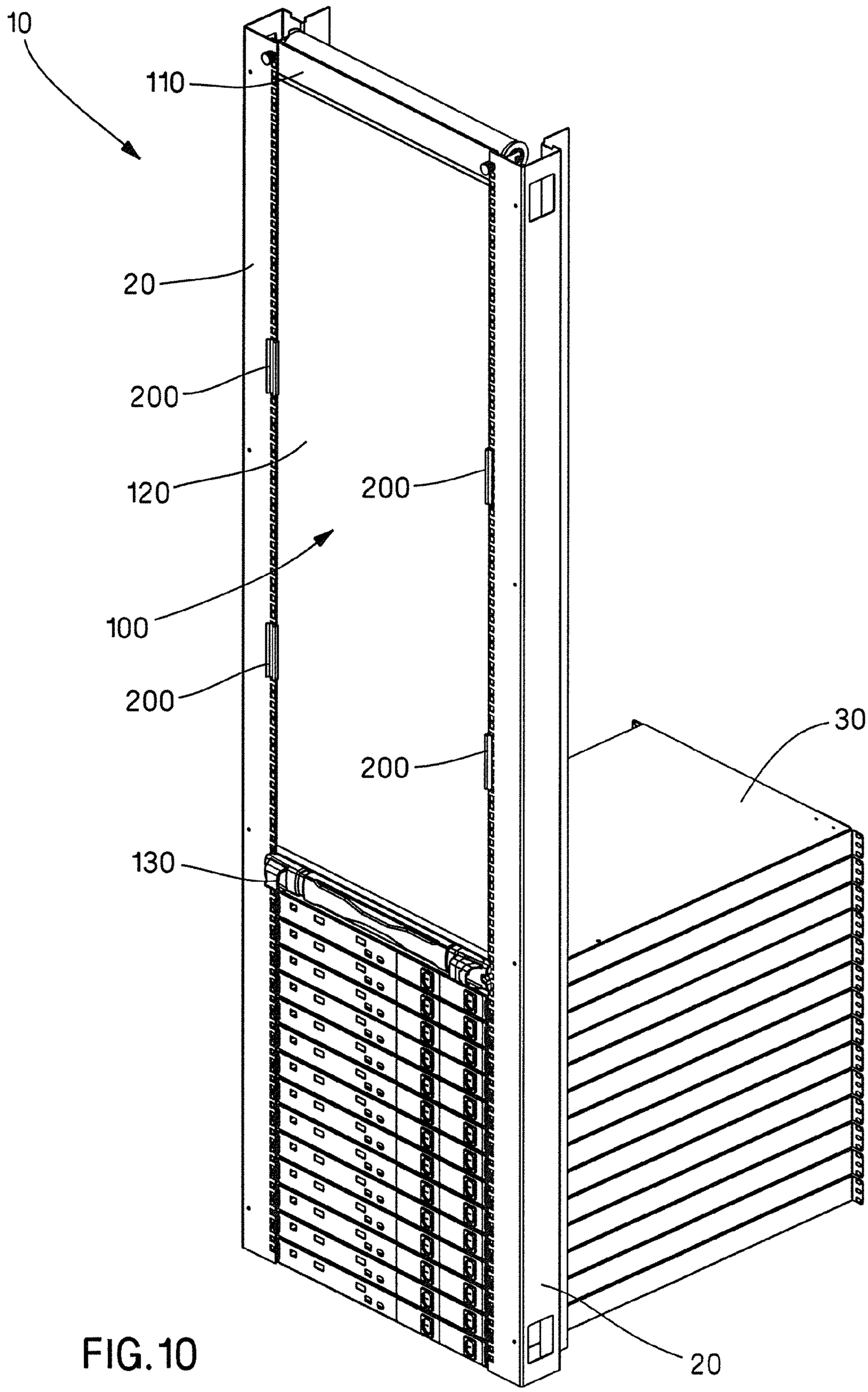


FIG. 10

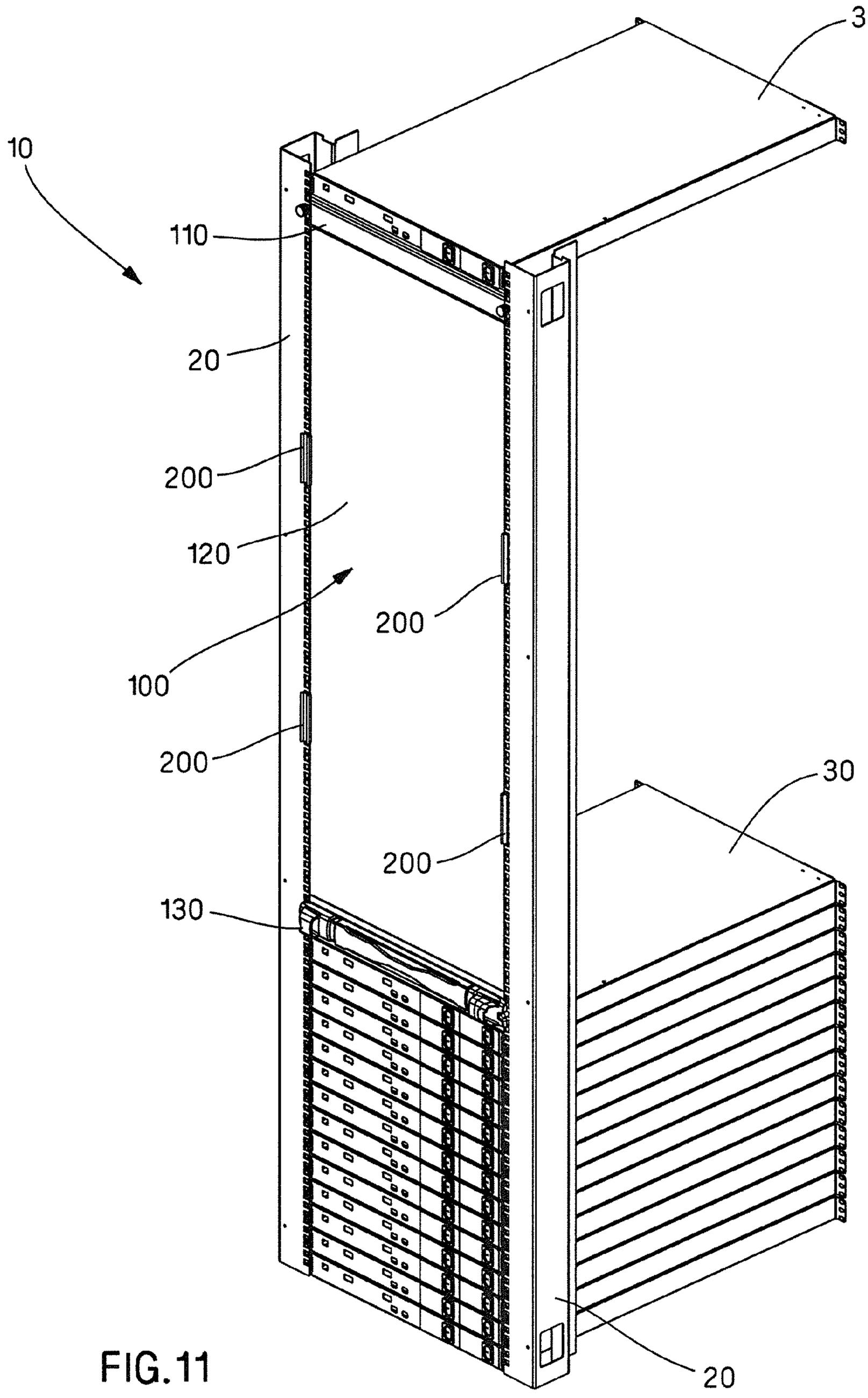


FIG.11

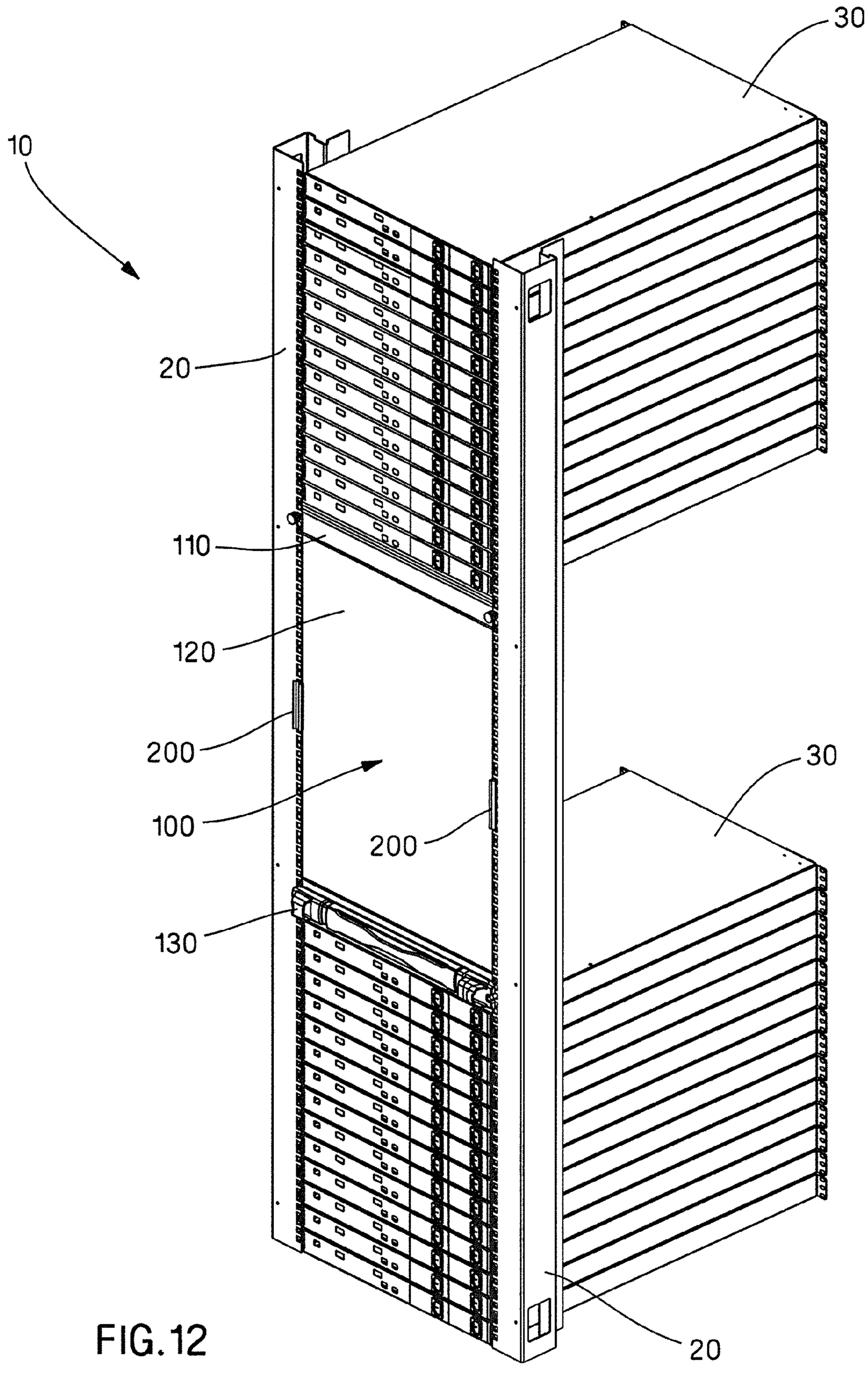


FIG.12

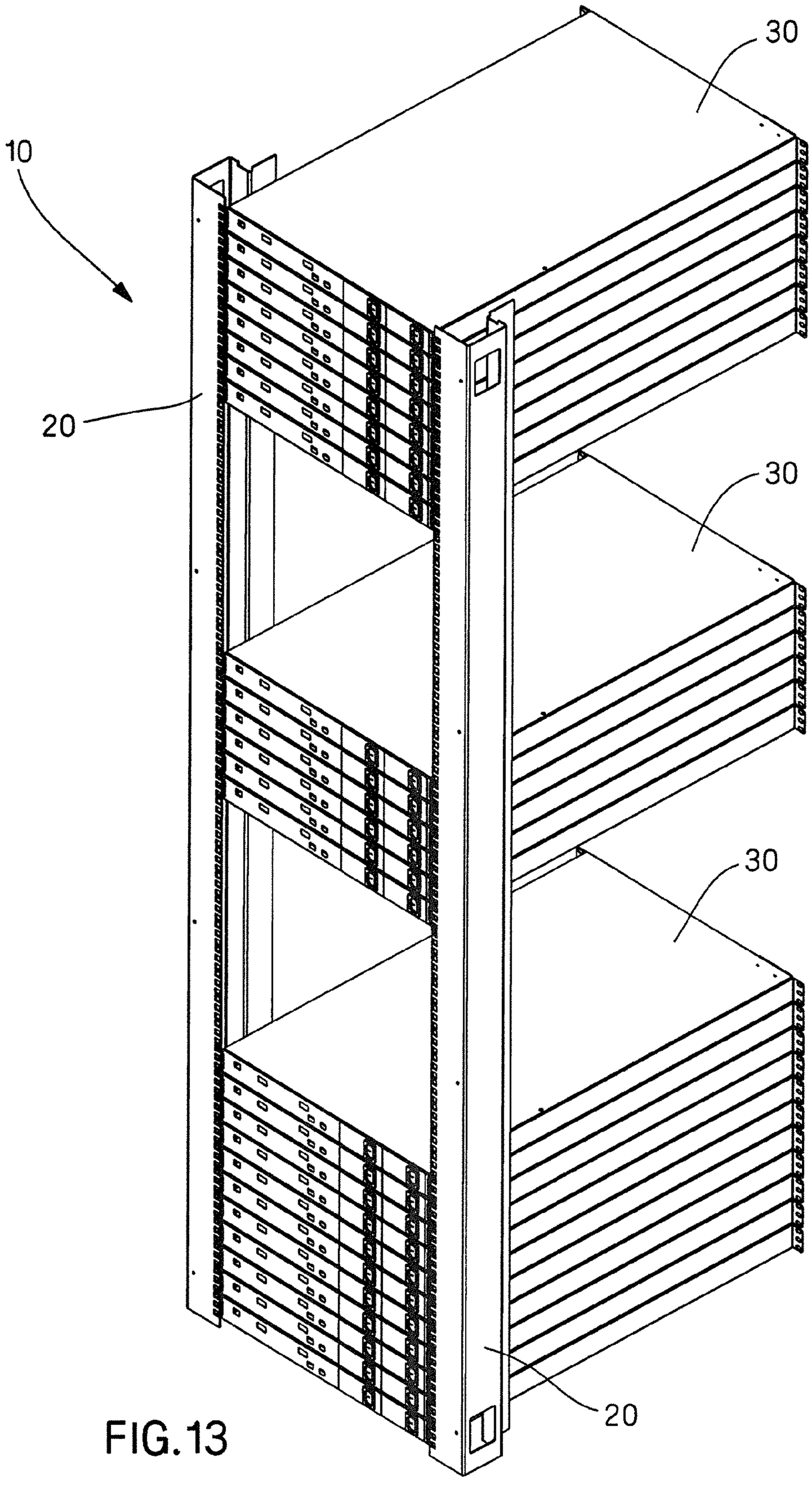


FIG. 13

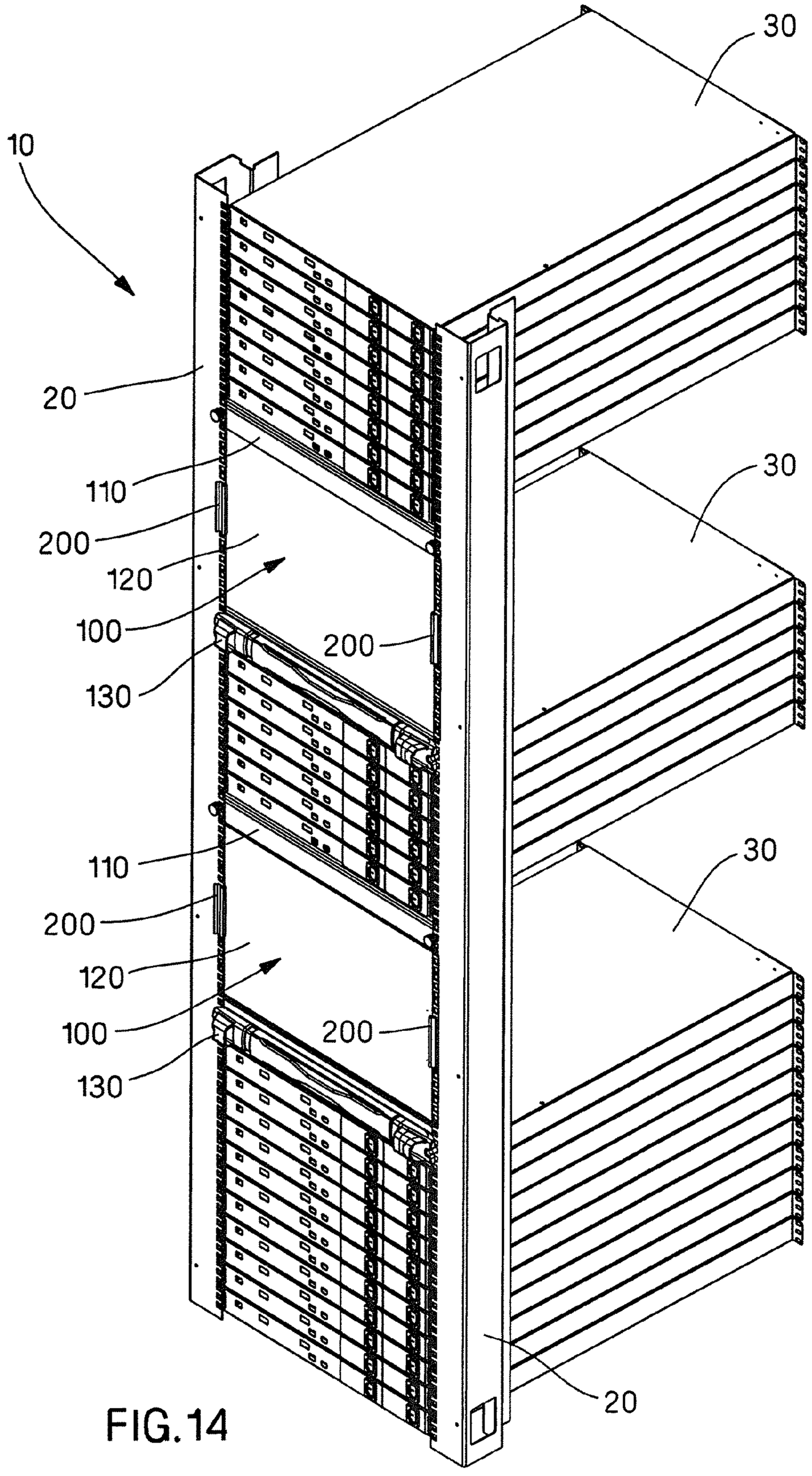


FIG.14

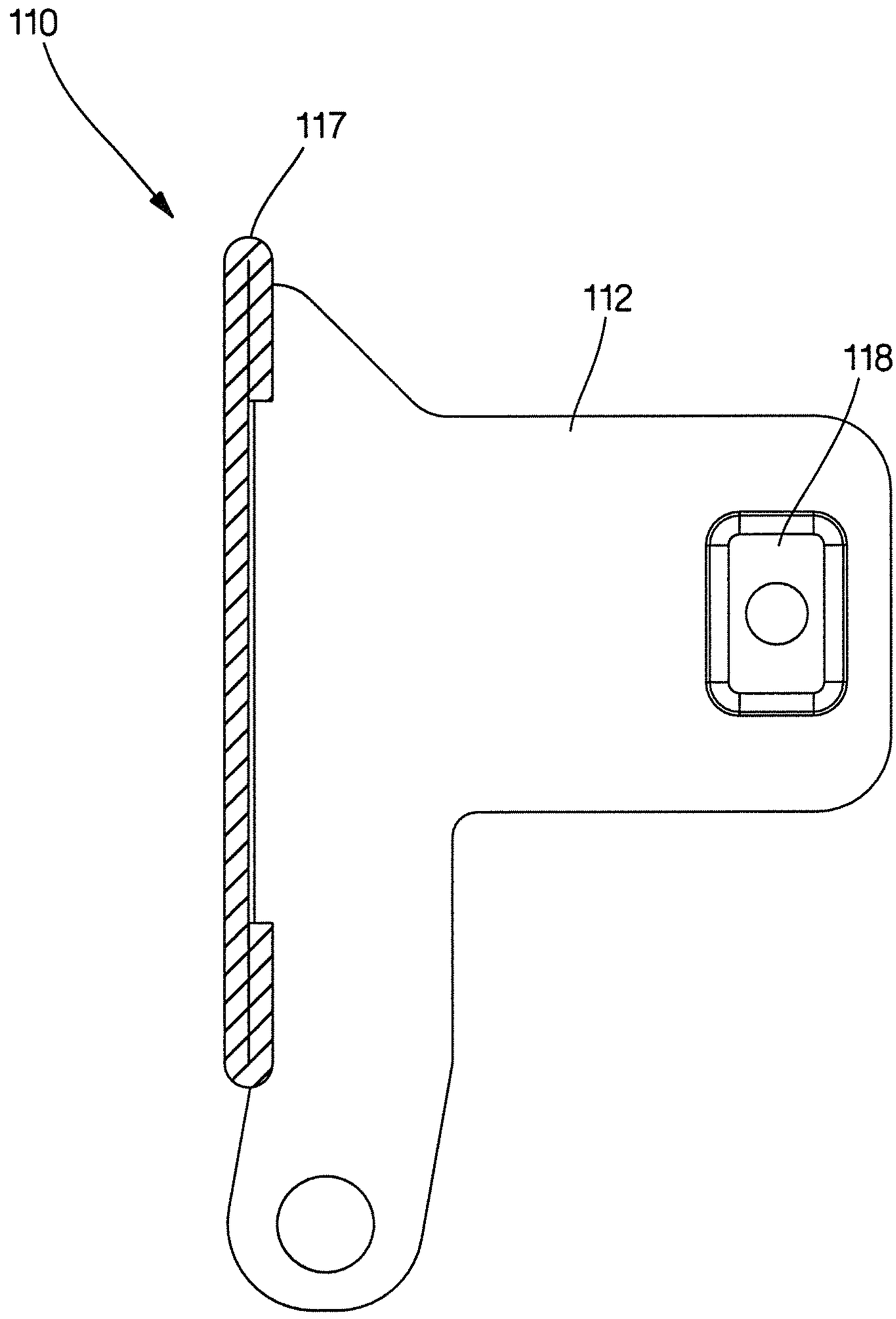


FIG. 15

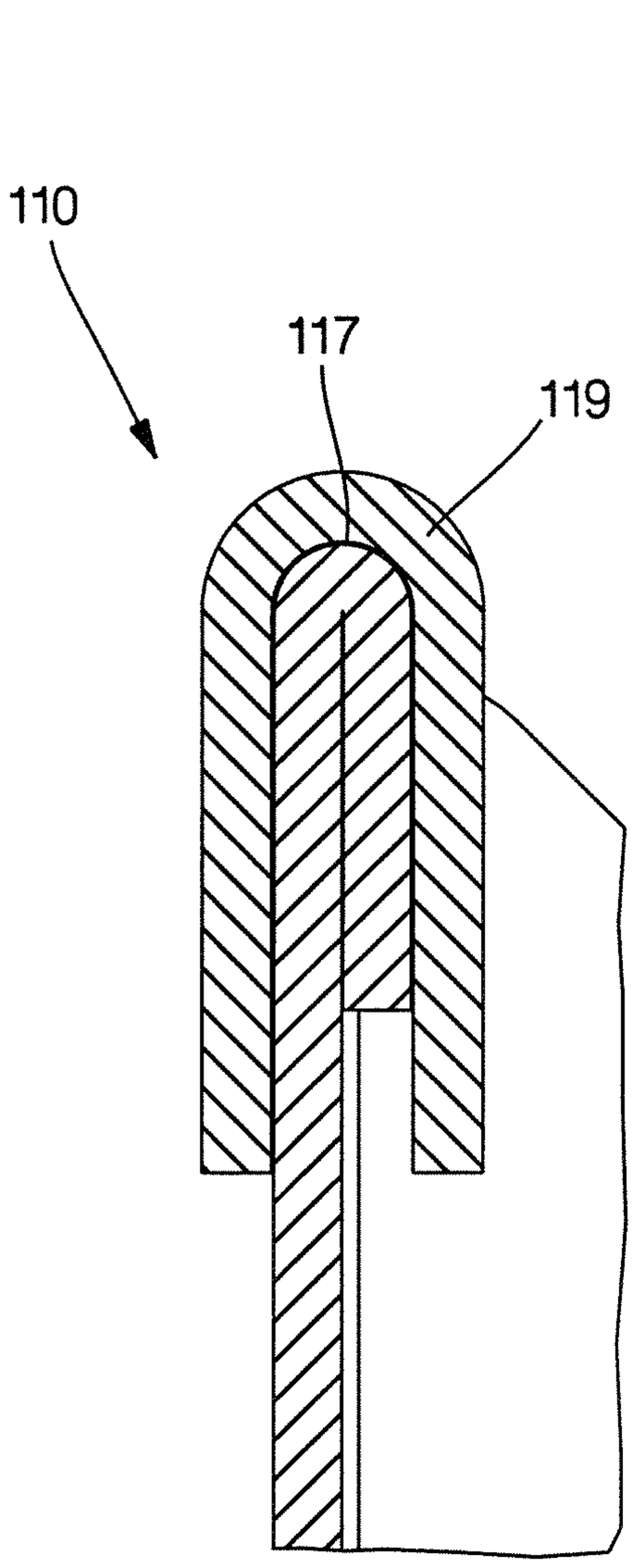


FIG.16

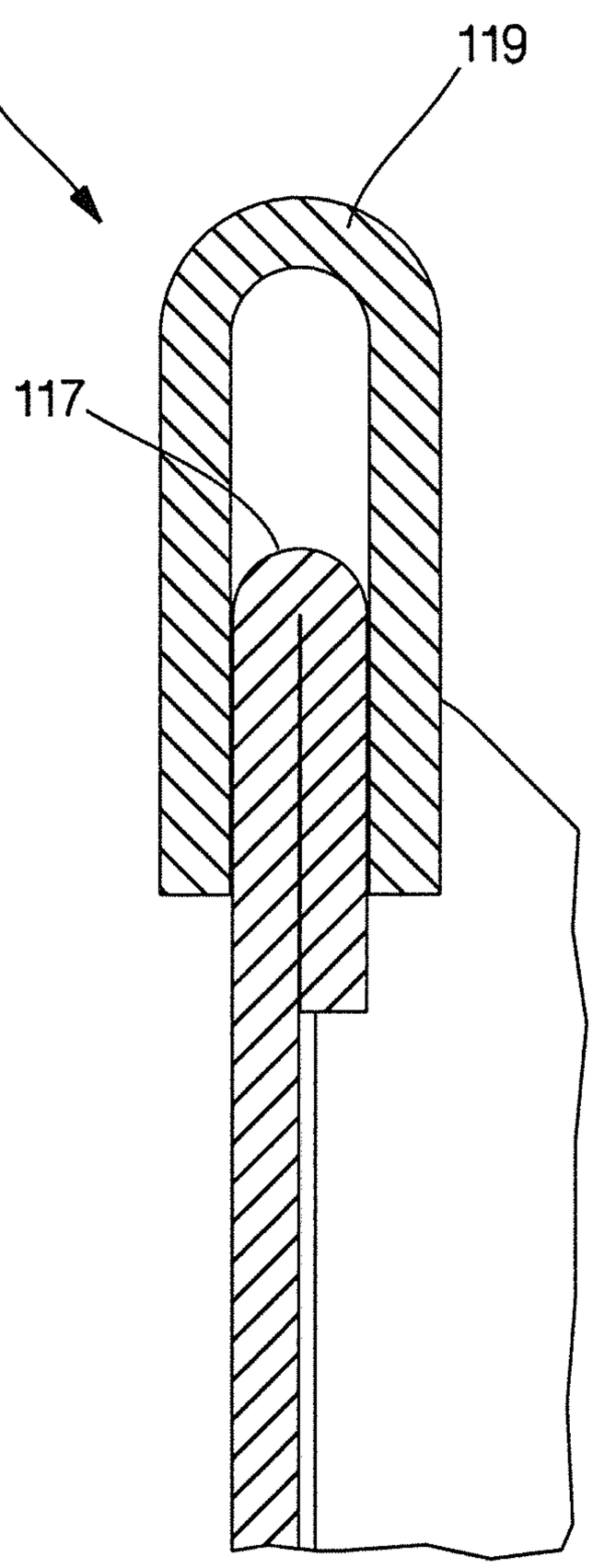


FIG.17

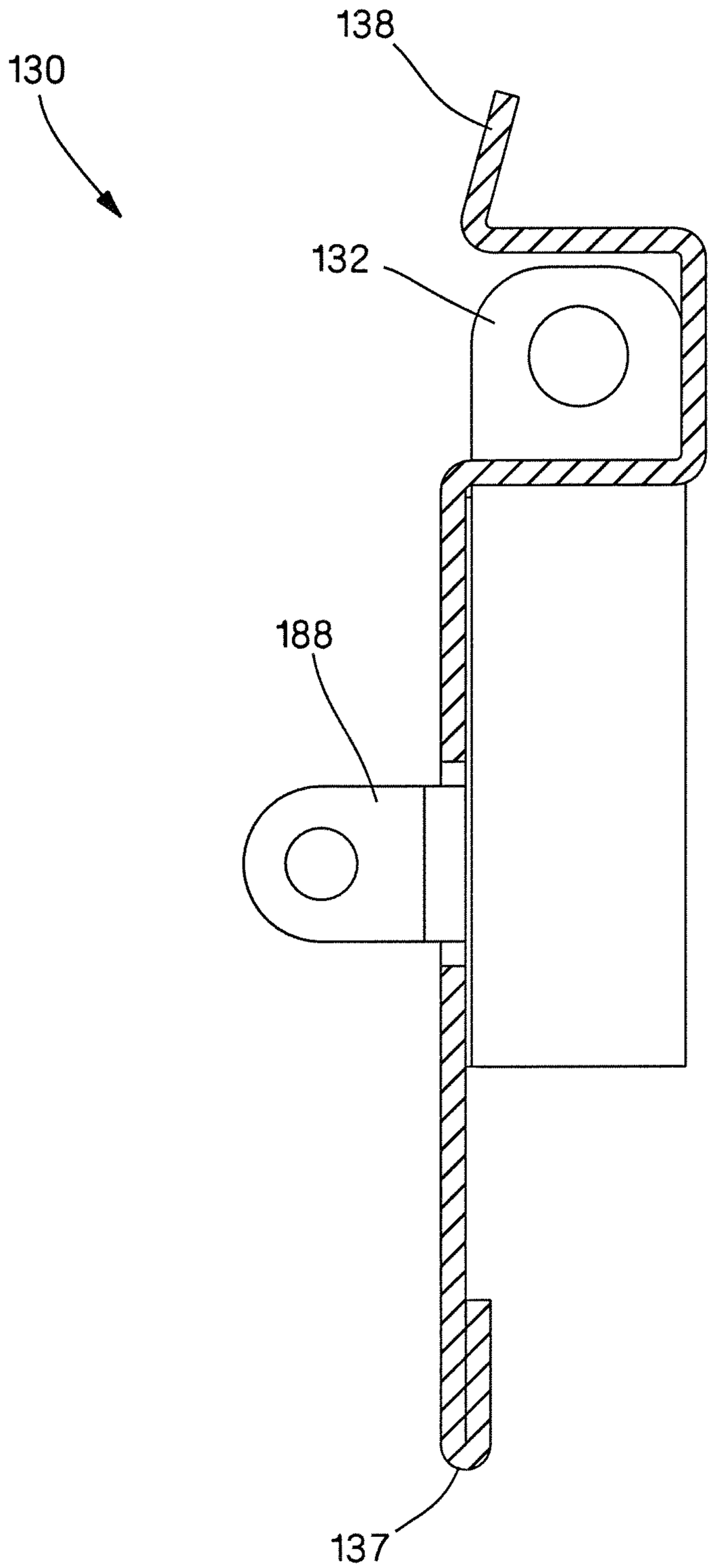


FIG. 18

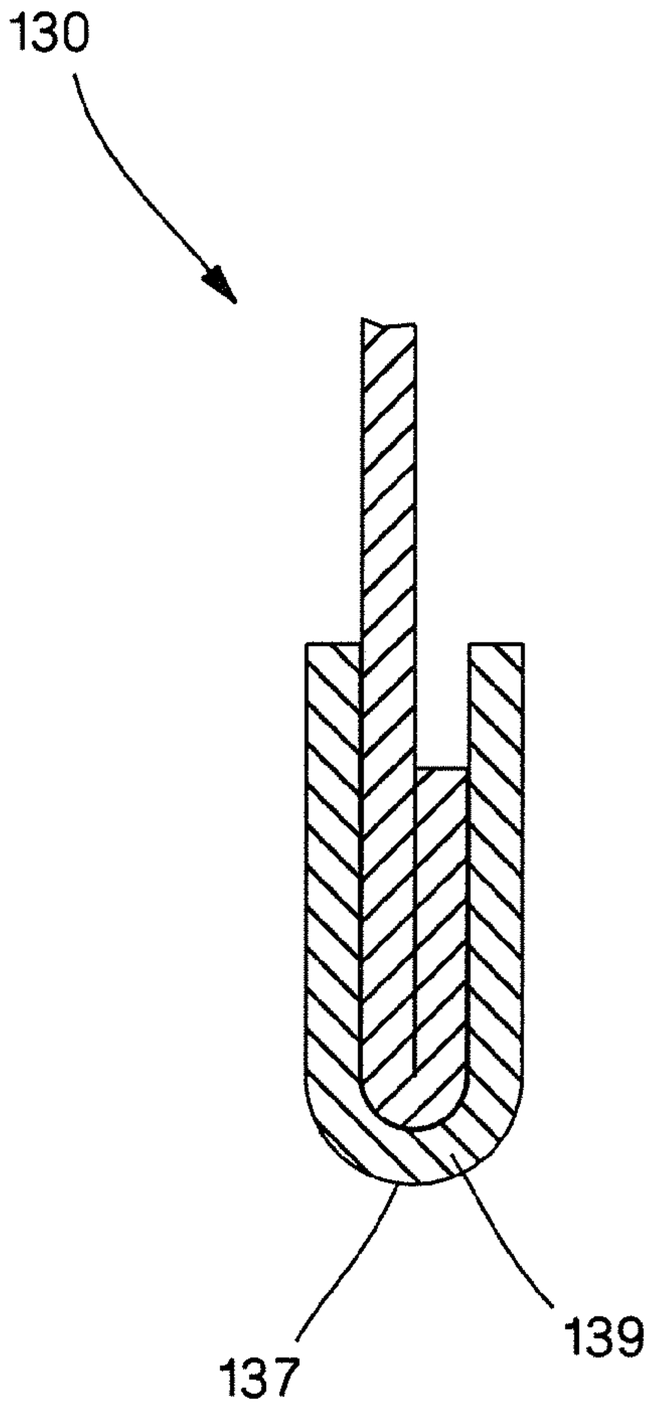


FIG.19

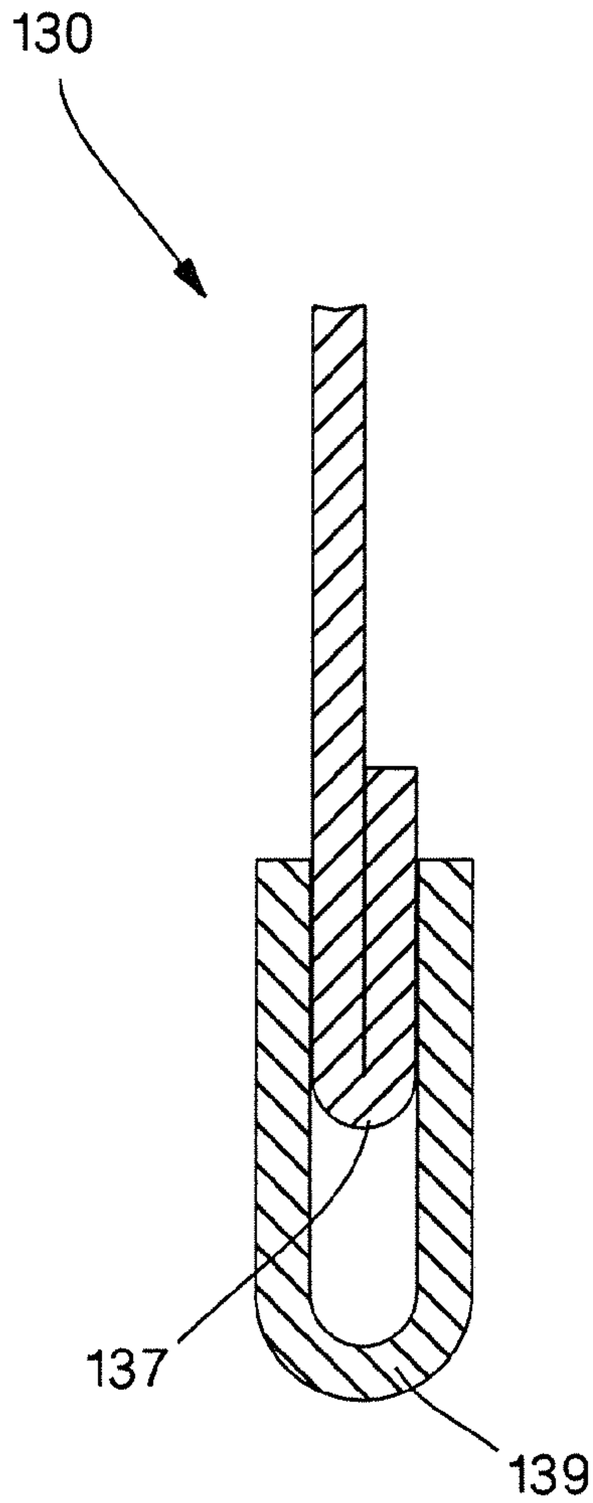


FIG.20

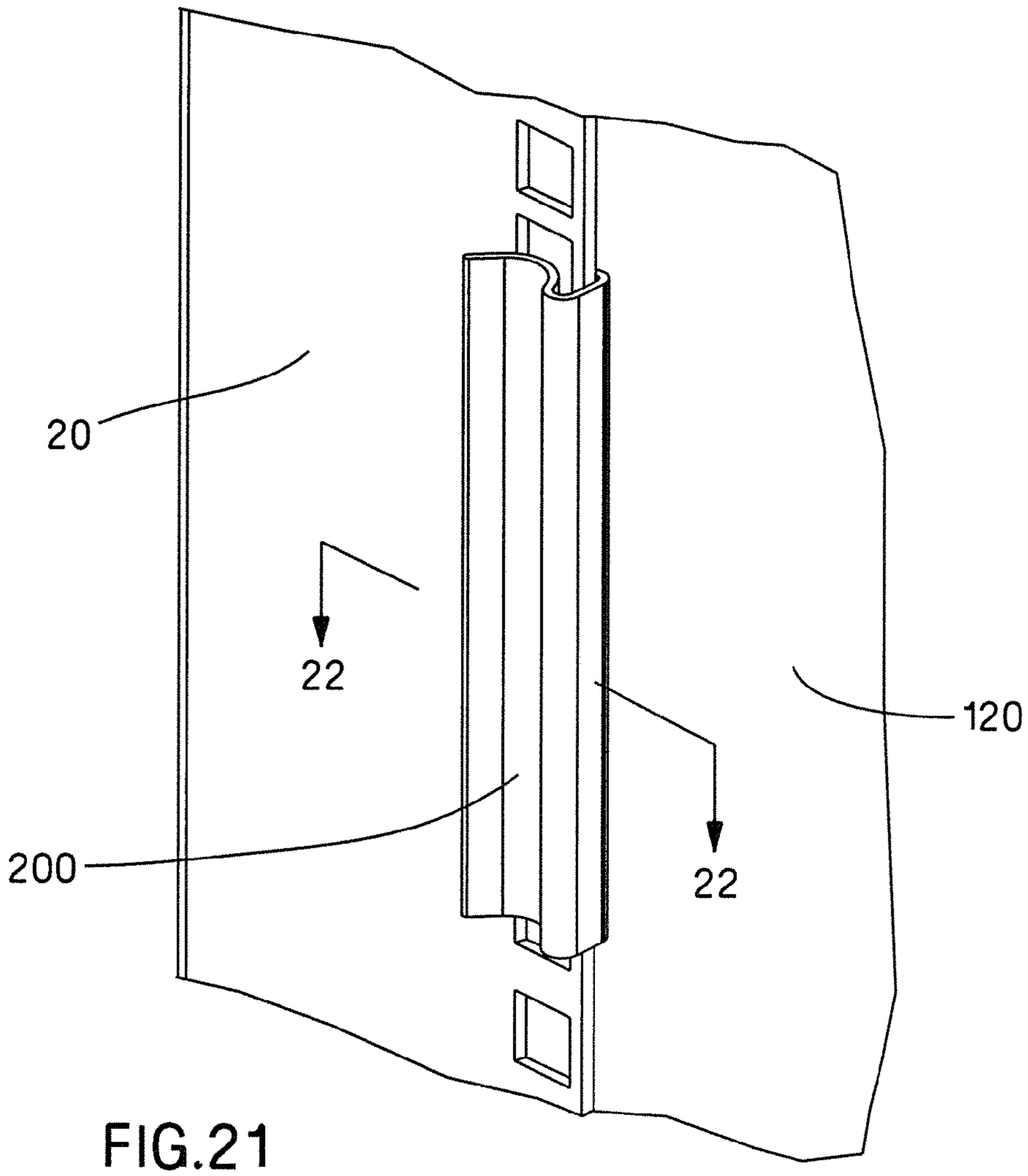


FIG.21

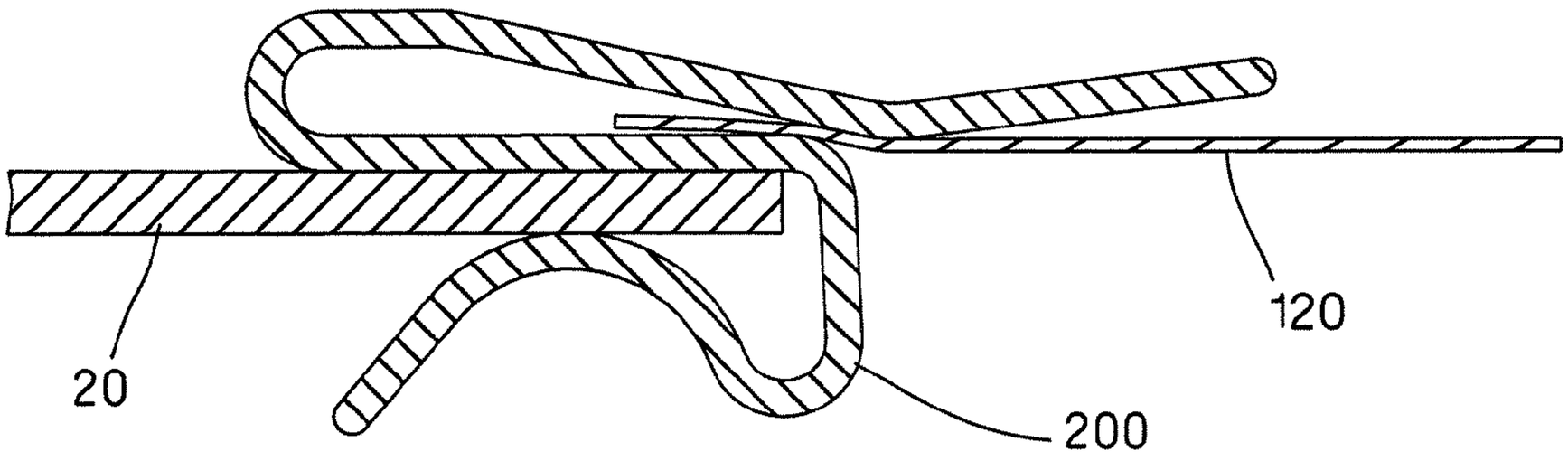


FIG.22

# ROLLER SHADE FILLER PANEL

## CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 13/314,730, filed on Dec. 8, 2011, which will issue as U.S. Pat. No. 8,915,286 on Dec. 23, 2014, which claims the benefit of U.S. Provisional Patent Application No. 61/424,116, filed on Dec. 17, 2010, each of which is incorporated by reference in its entirety.

## BACKGROUND OF THE INVENTION

The present invention relates to a filler panel, and more particularly, a roller shade filler panel for a rack.

Filler panels are well known in the art. Typically, filler panels are capable of accommodating only one size of opening. However, as electronic equipment is added to and subtracted from a rack, the size of the opening changes. Therefore, there is a need for a filler panel that is capable of accommodating more than one size of opening.

## SUMMARY OF THE INVENTION

Certain embodiments of the present invention provide an apparatus for closing off an opening above, below, or between electronic equipment in a rack. The rack includes a pair of equipment rails. The electronic equipment is mounted to the equipment rails. The apparatus includes a base, a roller shade, and a handle. The roller shade is rotatably connected to the base and includes a free end extending from the base when the roller shade is rotated. The handle is connected to the free end of the roller shade. The base is removably connected to the pair of equipment rails at a first position. The handle is removably connected to the pair of equipment rails at a second position spaced apart from the first position such that the free end of the roller shade is extended to close off the opening in the rack.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a roller shade filler panel for a rack according to an embodiment of the present invention;

FIG. **2** is an exploded view of the roller shade filler panel of FIG. **1**;

FIG. **3** is a perspective view of a portion of a rack;

FIG. **4** is a perspective view of the roller shade filler panel of FIG. **1** installed in the rack of FIG. **3**;

FIG. **5** is an enlarged view of the roller shade filler panel of FIG. **4**, showing one side of the base removably connected to the equipment rail;

FIG. **6** is an exploded view of a floating cage nut and a threaded thumb screw knob for the base of FIG. **5**;

FIG. **7** is an enlarged view of the roller shade filler panel of FIG. **4**, showing one side of the handle removably connected to the equipment rail;

FIG. **8** is an exploded view of a floating cage nut and a bullet for the handle of FIG. **7**;

FIG. **9** is a perspective view of the roller shade filler panel of FIG. **4**, showing the handle repositioned to accommodate equipment installed below the roller shade filler panel;

FIG. **10** is a perspective view of the roller shade filler panel of FIG. **9**, showing the handle repositioned to accommodate additional equipment installed below the roller shade filler panel;



FIG. **11** is a perspective view of the roller shade filler panel of FIG. **10**, showing the base repositioned to accommodate equipment installed above the roller shade filler panel;

FIG. **12** is a perspective view of the roller shade filler panel of FIG. **11**, showing the base repositioned to accommodate additional equipment installed above the roller shade filler panel;

FIG. **13** is a perspective view of the rack of FIG. **3**, showing equipment installed at various locations along the equipment rails;

FIG. **14** is a perspective view of the roller shade filler panel of FIG. **1**, showing two of the roller shade filler panels of FIG. **1** positioned between the equipment in the rack of FIG. **13**;

FIG. **15** is a cross-sectional view taken along line **15-15** of FIG. **2**, showing the base of the roller shade filler panel;

FIG. **16** is an enlarged view of the base of FIG. **15**, showing the adjustable edge seal on the top edge of the base in a retracted position;

FIG. **17** is an enlarged view of the base of FIG. **15**, showing the adjustable edge seal on the top edge of the base in an extended position;

FIG. **18** is a cross-sectional view taken along line **18-18** of FIG. **2**, showing the handle of the roller shade filler panel;

FIG. **19** is an enlarged view of the handle of FIG. **15**, showing the adjustable edge seal on the bottom edge of the base in a retracted position;

FIG. **20** is an enlarged view of the handle of FIG. **15**, showing the adjustable edge seal on the bottom edge of the base in an extended position;

FIG. **21** is an enlarged view of the roller shade filler panel of FIG. **4**, showing one of the clips for securing the roller shade to the equipment rails; and

FIG. **22** is a cross-sectional view taken along line **22-22** of FIG. **21**.

## DETAILED DESCRIPTION

FIGS. **1-14** illustrate a roller shade filler panel **100** for a rack **10**, such as a 2-post rack or a 4-post rack, which may also be referred to as a cabinet or an enclosure, according to an embodiment of the present invention.

As best seen in FIG. **1**, the roller shade filler panel **100** includes a base **110**, a roller shade **120** rotatably connected to the base **110**, and a handle **130** connected to a free end **122** of the roller shade **120**. The roller shade **120** rotates from a retracted position (FIG. **1**) to an extended position (FIGS. **4**, **9-12**, and **14**). Preferably, the roller shade **120** is under constant tension so that it will return to the retracted position, but it is likewise contemplated that the roller shade **120** includes a tension-relieving device, for example, similar to that of a seat belt or a window shade.

As best seen in FIG. **2**, the base **110** includes a pair of side flanges **112**. The side flanges **112** are for mounting the roller shade **120** to the base **110**. Additionally, the side flanges **112** are for mounting a roller shade guide rod **114** to the base **110**. The roller shade guide rod **114** is secured to the base **110** by a pair of fasteners **116**. The roller shade guide rod **114** is for aligning the roller shade **120** with the front of the base **110**.

As shown in FIGS. **1** and **2**, the base **110** includes a grounding fastener **115**, for example, mounted between one of the side flanges **112** and the grounding rod **114**, for grounding the roller shade filler panel **100**.

As best seen in FIG. **2**, the roller shade **120** includes a pair of pins **124** for engaging the side flanges **112** of the base **110** and a pair of end caps **126** for minimizing "walking" as the

roller shade **120** retracts. Preferably, the side flanges **112** include embossed regions **118** for engaging the pins **124** and the end caps **126**, and minimizing side-to-side movement of the roller shade **120**.

Additionally, as best seen in FIG. **2**, the handle **130** includes a pair of side flanges **132**. The side flanges **132** are for mounting a roller shade mounting rod **134** to the handle **130**. The free end **122** of the roller shade **120** includes a loop **128**. The roller shade mounting rod **134** is positioned through the loop **128** and secured to the handle **130** by a pair of fasteners **136**. Additionally, the handle **130** includes a top flange **138**. The top flange **138** is for aligning the roller shade **120** with the front of the handle **130**.

As best seen in FIG. **3**, the rack **10** includes a pair of equipment rails **20**, which may also be referred to as channels or posts. Other components of the rack **10**, such as floor mounting brackets and adjustable shelves, as well as additional equipment rails, channels, and posts, have been omitted for clarity.

As shown in FIG. **4**, the roller shade filler panel **100** is positioned in the rack **10** and extends from the top of the equipment rails **20** to the bottom of the equipment rails **20**, closing off the opening between the equipment rails **20**.

The roller shade filler panel **100** is removably connected to the equipment rails **20**. For example, as shown in FIG. **5**, the base **110** is removably connected to the equipment rails **20** by a floating cage nut **140** and a threaded thumb screw knob **150**. Similarly, as shown in FIG. **7**, the handle **130** is removably connected to the equipment rails **20** by a floating cage nut **160**, a bullet **170**, and a pair of latches **180**, each of which is slidably connected to the handle **130** by a shaft **182**, a spring **184**, a pair of o-rings **186**, and a pair of front flanges **188**. Additionally, as best seen in FIG. **2**, the handle **130** includes a latch cover **190** for covering proximate ends of the latches **180**. The cover **190** is secured to the handle **130** by a pair of fasteners **192**.

As shown in FIG. **6**, the floating cage nut **140** includes a floating portion **142** for accommodating non-standard spacing between the equipment rails **20**. Similarly, as shown in FIG. **8**, the floating cage nut **160** includes a floating portion **162** for accommodating non-standard spacing between the equipment rails **20**, as well as a fastener **164** for engaging the bullet **170**. It is likewise contemplated that the roller shade filler panel **100** includes a standard cage nut.

As shown in FIGS. **9-12**, the roller shade filler panel **100** is repositioned to accommodate equipment **30**, such as servers, switches, and patch panels, as the equipment **30** is installed in the rack **10**. For example, as shown in FIGS. **9** and **10**, without removing the base **130** from the equipment rails **20**, the handle **130** is repositioned to accommodate equipment **30** installed below the roller shade filler panel **100**. Similarly, as shown in FIGS. **11** and **12**, without removing the handle **130** from the equipment rails **20**, the base **110** is repositioned to accommodate equipment **30** installed above the roller shade filler panel **100**.

Alternatively, as shown in FIGS. **13** and **14**, two roller shade filler panels **100** are positioned between the equipment **30**.

In certain embodiments of the present invention, the roller shade filler panel **100** includes an adjustable edge seal. For example, as shown in FIGS. **15-17**, a top edge **117** of the base **110** includes an adjustable edge seal **119** for sealing against equipment **30** installed above the roller shade filler panel **100**. Similarly, as shown in FIGS. **18-20**, a bottom edge **137** of the handle **130** includes an adjustable edge seal **139** for sealing against equipment **30** installed below the roller shade filler panel **100**.

In certain embodiments of the present invention, the roller shade filler panel **100** includes radio-frequency identification ("RFID"). For example, components of the roller shade filler panel **100**, including the base **110** and the handle **130**, as well as components of the rack **10**, including the equipment rails **20**, preferably at one rack unit ("1RU") intervals, and the equipment **30**, include RFID tags to determine the location of the roller shade filler panel **100**, for example, with respect to the rack **10**, the equipment rails **20** and the equipment **30**.

As best seen in FIGS. **21** and **22**, but also shown in FIGS. **4**, **9-12**, and **14**, the roller shade filler panel **100** includes one or more clips **200** for securing the roller shade **120** to the equipment rails **20**.

While this invention has been described in conjunction with the exemplary embodiments outlined above, various alternatives, modifications, variations, and/or improvements, whether known or presently unforeseen, may become apparent. Accordingly, the exemplary embodiments of the invention as set forth above are intended to be illustrative, not limiting. Various changes may be made without departing from the spirit and scope of the invention.

The invention claimed is:

**1**. An apparatus for closing off an opening above, below, or between electronic equipment in a rack, the rack comprising an equipment rail, the electronic equipment mounted to the equipment rail, the apparatus comprising:

a base removably connected to the equipment rail;

a roller shade rotatably connected to the base, the roller shade having a free end, the free end extending from the base when the roller shade is rotated; and

a handle connected to the free end of the roller shade, the handle having a pin extending from the handle and through an opening in the equipment rail, along a pin axis and a latch slidably connected to the handle along a latch axis transverse relative to the pin axis, wherein the equipment rail is positioned between the handle and the latch, and the latch is configured to engage and disengage the pin.

**2**. The apparatus of claim **1**, wherein the base includes a pair of side flanges for receiving the roller shade.

**3**. The apparatus of claim **2**, wherein each of the side flanges includes an embossed region.

**4**. The apparatus of claim **1**, wherein the roller shade includes a pair of pins for rotatably connecting the roller shade to the base.

**5**. The apparatus of claim **1**, wherein the roller shade includes a pair of end caps for minimizing side-to-side movement of the roller shade.

**6**. The apparatus of claim **1**, wherein the roller shade includes a tensioning device.

**7**. The apparatus of claim **1**, wherein the handle includes a mounting rod for securing the handle to the free end of the roller shade.

**8**. The apparatus of claim **7**, wherein the free end of the roller shade includes a loop for receiving the mounting rod.

**9**. The apparatus of claim **1**, wherein the base includes a guide rod for aligning the roller shade with the front of the base.

**10**. The apparatus of claim **1**, wherein the handle includes a top flange for aligning the roller shade with the front of the handle.

**11**. The apparatus of claim **1**, wherein the handle includes a floating cage nut, the floating cage nut having a first portion removably connected to the handle and a second portion slidably connected to the first portion such that the second portion slides relative to the handle.

**12**. The apparatus of claim **11**, wherein the pin extends from the second portion of the floating cage nut.

**13**. The apparatus of claim **1**, wherein the base includes a floating cage nut, the floating cage nut having a first portion removably connected to the base and a second portion slidably connected to the first portion such that the second portion slides relative to the base.

**14**. The apparatus of claim **13**, wherein the base includes a thumb screw removably connected to the second portion of the floating cage nut.

**15**. The apparatus of claim **1**, further comprising a clip for securing a side of the roller shade to the rack.

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